

Subject: glowbugs V1 #236

glowbugs

Tuesday, February 3 1998

Volume 01 : Number 236

Date: Mon, 2 Feb 1998 19:27:32 +0000

From: Sandy W5TVW <ebjr@worldnet.att.net>

Subject: "CX" this weekend..

20 meters was slim pickins'! 40 was very active. I managed to use most of my gear. Was saving the "big gun" for 80 and also the '10 Hartley for 80 as well. Unfortunately, we had thunderstorms here which just about wiped out any hope of any decent 80 meter operations! My score and fun suffered this time! I also understand there was a foul-up in some of the "magazine" announcements for CX and some people worked it Saturday instead of Sunday. Didn't even try any AM phone due to the noise!

Wait 'till next time!

73,

E. V. Sandy Blaize, W5TVW

"Boat Anchors collected, restored, repaired, traded and used!"

417 Ridgewood Drive

Metairie, LA., 70001

860 Hartley 'ECO' construction "on hold"**

*** Looking for a TRC-10 transceiver *****

*** Looking for an RAL receiver *****

Date: Mon, 2 Feb 1998 13:19:32 -0600 (CST)

From: glueck@austin.ibm.com (Glueck)

Subject: AEA AT-300 Switch needed

I got a 300 watt AEA Ant tuner at a swapfest which needs one of two inductor switches, the one on the TRANSMITTER inductor (appears to be very much like the other switch on ANTENNA side, but am not for sure). This is a two wafer switch that is bigger than the standard Centralab switch assemblies that are reasonably plentiful. The switch is burned up, probably from switching the taps under power. I had heard that AEA was absorbed by someone else, but do not know who. Parts may have been available from yet another source, as I remember.

The unit is model AT-300 with cross-needle meter, three tuning knobs (two switches and one tuning capacitor), and antenna selector switch plus a couple of lesser switches to change meter power level and turn on lamp for meter.

If there are folks out there that knows where to get parts, please answer to either my email address directly (glueck@austin.ibm.com) - the preferred approach - or to the list.

Thanks,

Howard Glueck / K5ZUA

Date: Mon, 2 Feb 1998 18:49:25 -0400
From: "Brian Carling" <bry@mnsinc.com>
Subject: Attn: JUNO ops!

For all of you e-mail-only guys, here is a helpful hint!

Please pass it along to ALL of the hams you know who use JUNO
or other e-mail-only based web access!!

For callsign-lookup-by-email send a blank message to:

lookup@qrz.com

You will get back the information on how to look up anyone!

Date: Tue, 3 Feb 1998 11:28:05 -0500 (EST)
From: rdkeys@csemail.cropsci.ncsu.edu
Subject: How are CW output power and input power and PEP related?

FOOD FOR THOUGHT AND DISCUSSION.....

(cuz ol' BA Bob has his dunce cap on today and don't haves his books
handy ta latch onto):

Can someone explain the relationship between average CW output power,
and PEP and how we technically measure both? The FCC rates power output
as PEP power. I want to make sure I am measuring things correctly.
I thought I knew how to do that, but now I am not so sure. I want to
make sure I get it exactly right.

The FCC rules stipulate PEP measurements for output power on all
transmitters.

One of the FCC OET bulletins indicates measuring peak RF voltage across
a calibrated load and equating it to obtain PEP as.....

$$\text{PEP} = (\text{Epeak} \times \text{Epeak}) / \text{R}.$$

Is this correct?

ON a CW sine wave (not complex waveform such as SSB modulation) how can
this be done with an average-reading RF current ammeter typically found
in the average glowbug junquebox? I prefer to use the simple RF ammeter
if I can.

If I am interpreting things correctly....

$$\text{Average Power} = \text{PEP} / 1.414 = 0.707 \text{ PEP}.$$

Thus if we are allowed 1500 watts PEP that is actually $0.707 \times 1500 = 1060$
watts average power (gee they gave us 60 watts). Is this correct?
Thus an old Navy KW CW rig can be loaded up to 1060 watts average power
output on CW and still meet the 1500 watts PEP limit? Is this correct?

I can measure the CW average power by using a simple RF ammeter into a
calibrated dummy load of say 50 ohms, and relate the measured average

RF current to power as:

$$\text{Average Power} = (I_{av} \times I_{av}) \times R.$$

$$\text{PEP} = 1.414 \text{ Average Power}.$$

For example, using a simple RF ammeter, I measure 1.5 amps into a 50 ohm dummy load. Then:

$$\text{Average Power} = (1.5 \times 1.5) \times 50 = 112.5 \text{ watts output average}$$

$$\text{PEP} = 1.414 \times 112.5 = 159.1 \text{ watts peak envelope power output}$$

Is this correct?

What needs to be put together for a proper RF voltmeter to measure PEP by the FCC method? (Hint... look in the 69 handbook in the test instruments section, perhaps.) A pair of rectifier diodes as a full wave into a small 100ua meter with proper capacitive coupling should do the trick, but is not as accurate as a VTVM or fet voltmeter, and it would give the average RF voltage, not the instantaneous RF voltage. But, taking that average reading into account, and the small error likely to be there, it will probably do for the average ham measurement. It might be better to measure the waveform on an oscilloscope perhaps? But, I don't always have an oscilloscope handy but should always at least have an averaging RF ammeter or RF voltmeter handy with the dummy load.

If using the averaging RF voltmeter, then:

$$\text{Peak RF voltage} = 1.414 \text{ RF average voltage}.$$

Thus for proper PEP measurement and calculating using our averaging RF voltmeter (the FW diode RF voltmeter from the 69 handbook):

$$\text{PEP} = ((1.414 \times E_{av}) \times (1.414 \times E_{av}))/R.$$

Is this correct?

Our glowbugs probably don't usually qualify as big-gun equipment, but, one or two might, and it is probably good we all review how to properly measure PEP on our glowbugs.

Am I all screwed up today, or am I missing the forest for the trees?

Thanks.....

Bob/NA4G

Date: Tue, 3 Feb 1998 11:34:57 -0600

From: mack@mails.imed.com (Ray Mack)

Subject: Re: How are CW output power and input power and PEP related?

BA Bob:

The answer to the first question is that RMS Power (what you call average power) is Erms * Erms/R.

PEP is $E_{\text{peak}} * E_{\text{peak}}/R$.

Now for the fun part: $E_{\text{peak}} = 1.414 * E_{\text{rms}}$

Substituting in the PEP equation above: $PEP = E_{\text{rms}} * 1.414 * E_{\text{rms}} * 1.414/R$

multiply 1.414 by 1.414 and the reduced equation is: $PEP = 2 * E_{\text{rms}} * E_{\text{rms}}/R$

Simplifying again: $PEP = 2 * P_{\text{rms}}$

The answer to question 2:

You can, indeed measure the peak of the waveform and do the calculation as described in the OET bulletin.

The answer to question 3:

See answer 1 above. Take your RMS (if it uses a thermocouple) ammeter reading for CW and square the current, multiply by 2, and then divide by R.

For a 50 Ohm system $PEP = I * I * 2/50$

The answer to question 4:

No it is not correct! You need to multiply by 1.414 one more time.

The answer to question 5:

Bob, your description of an RF voltmeter is a *peak* reading meter!!! There are 2 sets of circuits in the figure (My book is 1977, but should be the same as your 1969). The top ones without capacitors give a good approximation to average voltage. Notice from the drawings that this is AVERAGE and *NOT* RMS. The 2 are different!! The circuits at the bottom of the figure use capacitors and give *PEAK* readings.

RMS is *MUCH* harder to do than peak unless you are sure you have a pure sine wave.

Remember that you are making a circuit that is exactly the same as a capacitor input power supply when doing the peak circuits, except you are getting the AC from your transmitter instead of a power transformer on the AC mains. I suspect that the ease of making a peak reading RF voltmeter over a true RMS is the reason for the method of measuring. The main source of error is the slight droop in the voltage due to the loading of the microammeter. Using a DVM or VTVM as the readout will give more accurate peak readings. It will also give a longer time constant so you can actually read the meter before the voltage falls off.

I did some quick calculations to see how important the diode drops are in the calculation. At 10 W PEP the peak voltage in a 50 Ohm system is 22 Volts. At 1500 W PEP the peak voltage is 193 volts!!! Better use some hefty diodes and resistors in that meter. Or better yet, use a 20 dB T pad attenuator ahead of the meter.

Answer to question 6:

These calculations suffer from the same errors as in the question 4 section.

Answer to question 7:

Not all screwed up, but probably overwhelmed by the algebra involved! It's good to do a sanity check from time to time. I know I frequently miss one of the small details then remember "oh, yeah. I knew that" :<)

Why life is the way it is:

I did the calculations when I was looking at just exactly how does AM vs SSB compare. In the old days we were limited to 1000 W DC input for the carrier. If we got 60% efficiency, we had 600 W RMS (1200 W PEP) out just for the carrier! When you add another 1200 W PEP for the modulator power, we were getting 2400 W PEP for AM when going full out and staying legal.

Today with the 1500 W PEP limit, we are limited to 375 W RMS of carrier. Obviously, those of us who like Admirable Modulation got stuck with a sizeable power drop with the new regulations.

Ray Mack
WD5IFS
mack@mails.imed.com
Friendswood (Houston), TX

Reply Separator

Subject: How are CW output power and input power and PEP related?

Author: rdkeys@csemail.cropsci.ncsu.edu at mails

Date: 2/3/98 11:28 AM

FOOD FOR THOUGHT AND DISCUSSION.....

(cuz ol' BA Bob has his dunce cap on today and don't have his books handy ta latch onto):

//question 1

Can someone explain the relationship between average CW output power, and PEP and how we technically measure both?

<snip>

//question 2

One of the FCC OET bulletins indicates measuring peak RF voltage across a calibrated load and equating it to obtain PEP as.....

$$\text{PEP} = (\text{E}_{\text{peak}} \times \text{E}_{\text{peak}}) / \text{R}.$$

Is this correct?

//question 3

ON a CW sine wave (not complex waveform such as SSB modulation) how can this be done with an average-reading RF current ammeter typically found in the average glowbug junquebox? I prefer to use the simple RF ammeter if I can.

<snip>

//question 4

<snip>

//question 5

What needs to be put together for a proper RF voltmeter to measure PEP by the FCC method?

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Is this correct?

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Our glowbugs probably don't usually qualify as big-gun equipment, but, one or two might, and it is probably good we all review how to properly measure PEP on our glowbugs.

Am I all screwed up today, or am I missing the forest for the trees?

Thanks.....

Bob/NA4G

Date: Tue, 3 Feb 1998 10:18:22 -0800 (PST)
From: Ken Gordon <keng@uidaho.edu>
Subject: 304TL socket...

I need ONE of these. I thought I had two, but can only find one.

I really can't understand why these things should be so hard to find. Several models of Nuclear Magnetic Resonance instruments as used in Chemistry Departments, Physics Departments, and Hospitals used up to 12 ea. 304TLs as shunt regulators, and most of those machines are now no longer being used.

Wonder where they all went?

Anyone got a socket they would part with for a reasonable sum?

Ken W7EKB

Date: Tue, 3 Feb 1998 18:48:14 +0000
From: Sandy W5TVW <ebjr@worldnet.att.net>
Subject: WTB: "White" boxes

Does anyone know of a source of miniature and other size "white boxes" for tubes other than Antique Electronic Supplies?

73,
E. V. Sandy Blaize, W5TVW
"Boat Anchors collected, restored, repaired, traded and used!"
417 Ridgewood Drive
Metairie, LA., 70001

860 Hartley 'ECO' construction "on hold"**
*** Looking for a TRC-10 transceiver *****
*** Looking for an RAL receiver *****

Date: Tue, 03 Feb 1998 20:01:50 +0100
From: Jan Axing <janax@algonet.se>
Subject: Re: How are CW output power and input power and PEP related?

rdkeys@csemail.cropsci.ncsu.edu wrote:

[shortened to save some BW]

>

> FOOD FOR THOUGHT AND DISCUSSION.....

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> handy ta latch onto):

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> and PEP and how we technically measure both? The FCC rates power output
> as PEP power. I want to make sure I am measuring things correctly.
> I thought I knew how to do that, but now I am not so sure. I want to
> make sure I get it exactly right.

Well, I have seen many definitions of what PEP is. Here in SM back before 1994 when new rules came in effect, power was defined as the RMS power of the carrier at the peak of the modulation envelope. The power should be measured with a current meter with a maximum specified time constant. Power back then was max 500W input.

Now after 1994, maximum power is 1000W (150W on 30 meter), no definition, no PEP no nothing. It's up to us to interpret it... I guess I can run an AM TX with 1000W carrier over here legally.

Back to the subject, I think that pre-94 definition was PEP even if it was not mentioned as such. With the same definition, CW would be allowed 1500W output since we measure the RMS at keydown. The OOK modulation envelope is an uneven square wave and the peak of the envelope will be the carrier itself.

For AM, peak RMS power at 100% is 4 times the carrier RMS power, thus the carrier would be limited to 375W RMS to stay within the 1500W limit.

The other definition most common I've seen is PEP=the peak power at the peak of the modulation envelope (not the RMS power). This does not make sense to me since then, by definition, CW would be limited to 1060W RMS. That is also the power dissipated in the dummy load if you put out 1500W PEP using this definition. Additionally, AM carrier would be limited to 265W RMS. RMS is what we usually see on our mechanical meters, DVM's show average which for a pure sine wave happens to be RMS.

The formula $PEP = E_{peak} \times E_{peak} / R$ is correct. We just have to define what E_{peak} is. Is it the RMS voltage at the peak of the envelope or is it the peak voltage at the peak of the envelope?

IMO, the first definition above (RMS at the peak of the envelope) is the correct one. The second definition above just don't make sense to me.

The legal definition is another matter. It depends on the technical skill of the people who wrote the rule. If the correct definition is the peak in the peak, I find it rather silly. Or am I screwed up today?

Jan, SM5GNN

Date: Tue, 3 Feb 1998 11:03:19 -0800 (PST)
From: Ken Gordon <keng@uidaho.edu>
Subject: 3579 QRG, last night.

Worked Jack, W7QQQ, and his beautiful sounding 813 crystal oscillator last

night (Monday). Band conditions not too hot. He had LOTS of static, and my 50 watts were difficult copy for him. HE was 579x here. Also heard W7ZFB later in the evening, but he didn't hear me, and N4QY, same story.

Several other un-identified signals tuning up at various times, which would have been Q-5 copy here.

It was good to hear the activity.

Ken W7EKB

Date: Tue, 3 Feb 1998 15:39:10 -0500 (EST)

From: rdkeys@csemail.cropsci.ncsu.edu

Subject: Re: How are CW output power and input power and PEP related?

This is where I was trying to go.....

> Take your RMS (if it uses a thermocouple) ammeter reading
> for CW and square the current, multiply by 2, and then divide by R.
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> For a 50 Ohm system $PEP = I * I * 2/50$

Using a simple junk box WWII surplus RF ammeter (thermocouple type with the separate or built-in thermocouple) and measuring the RF into the classic 50 ohm dummy.

FCC's $PEP == I \times I \times 2/50$.

I knew I was not losing it entirely, but forgot the twice the square root of two thingie and how to get there correctly.....(:+\.....

Geesh, I should know better.....

Thanks

Bob/NA4G

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> Ray Mack
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> Thanks.....
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> Bob/NA4G
>
>

```

Date: Tue, 03 Feb 1998 14:01:01 -0600
 From: Conard Murray <ws4s@InfoAve.Net>
 Subject: Re: How are CW output power and input power and PEP related?

```

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>> for CW and square the current, multiply by 2, and then divide by R.
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>

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When I have used the hot wire ammeters for power measurement and then compared results with a wattmeter, I find I get the proper reading assuming

the meter is reading peak current rather than rms currentI have been using $I^2 \cdot R$. This works with the meter in the TCS anyway. I guess it is all in how you mark the meter face. I don't remember seeing anything stating whether the calibration was in rms or peak ... just RF amps. Anyone know if these RF ammeters are calibrated in RMS or peak?
73 de Conard, WS4S

End of glowbugs V1 #236
